11-1-2015

# The Poverty Implications of Alternative Tax Reforms: Some Countries Intuitive Results In An Application To Pakistan

Andrew Feltenstein
*Georgia State University*, afeltenstein@gsu.edu

Carolina Mejia
*World Bank*

David Newhouse
*World Bank*

Gohar Sedrakyan
*Goergia State University*

International Center for Public Policy
Working Paper 15-06
November 2015

# The Poverty Implications of Alternative Tax Reforms: Some Countries Intuitive Results In An Application To Pakistan

**Andrew Feltenstein**
**Carolina Mejia**
**David Newhouse**
**Gohar Sedrakyan**

Georgia State University | Andrew Young School of Policy Studies

Georgia State University | Andrew Young School of Policy Studies

**International Center for Public Policy**
**Working Paper 15-06**

# The Poverty Implications of Alternative Tax Reforms: Some Counter-Intuitive Results In An Application To Pakistan

**Andrew Feltenstein**
**Carolina Mejia**
**David Newhouse**
**Gohar Sedrakyan**

**November 2015**

# International Center for Public Policy
# Andrew Young School of Policy Studies

The Andrew Young School of Policy Studies was established at Georgia State University with the objective of promoting excellence in the design, implementation, and evaluation of public policy. In addition to two academic departments (economics and public administration), the Andrew Young School houses seven leading research centers and policy programs, including the International Center for Public Policy.

The mission of the International Center for Public Policy is to provide academic and professional training, applied research, and technical assistance in support of sound public policy and sustainable economic growth in developing and transitional economies.

The International Center for Public Policy at the Andrew Young School of Policy Studies is recognized worldwide for its efforts in support of economic and public policy reforms through technical assistance and training around the world. This reputation has been built serving a diverse client base, including the World Bank, the U.S. Agency for International Development (USAID), the United Nations Development Programme (UNDP), finance ministries, government organizations, legislative bodies and private sector institutions.

The success of the International Center for Public Policy reflects the breadth and depth of the in-house technical expertise that the International Center for Public Policy can draw upon. The Andrew Young School's faculty are leading experts in economics and public policy and have authored books, published in major academic and technical journals, and have extensive experience in designing and implementing technical assistance and training programs. Andrew Young School faculty have been active in policy reform in over 40 countries around the world. Our technical assistance strategy is not to merely provide technical prescriptions for policy reform, but to engage in a collaborative effort with the host government and donor agency to identify and analyze the issues at hand, arrive at policy solutions and implement reforms.

The International Center for Public Policy specializes in four broad policy areas:

- Fiscal policy, including tax reforms, public expenditure reviews, tax administration reform
- Fiscal decentralization, including fiscal decentralization reforms, design of intergovernmental transfer systems, urban government finance
- Budgeting and fiscal management, including local government budgeting, performance-based budgeting, capital budgeting, multi-year budgeting
- Economic analysis and revenue forecasting, including micro-simulation, time series forecasting,

For more information about our technical assistance activities and training programs, please visit our website at http://aysps.gsu.edu/isp/index.html or contact us by email at gbotello1@gsu.edu

# THE POVERTY IMPLICATIONS OF ALTERNATIVE TAX REFORMS: SOME COUNTER-INTUITIVE RESULTS IN AN APPLICATION TO PAKISTAN

BY

Andrew Feltenstein (Georgia State University, afeltenstein@gsu.edu)[1]
Carolina Mejia (World Bank)
David Newhouse (World Bank)
Gohar Sedrakyan (Georgia State University)

## Abstract

*This paper presents results from four simulations of the impact of potential tax reforms in Pakistan on poverty, shared prosperity, and inequality. The simulations are carried out in the context of a dynamic computational general equilibrium (CGE) model that incorporates endogenous evasion of the corporate income tax. The simulations are: a forward looking benchmark case, an increase in the corporate income tax from 35 to 45 percent, a rise in the General Sales Tax (GST) from 16 to 17 percent, and an increase in the tariff rate from 14 percent to 19 percent. The simulations link the CGE model to household survey data that is incorporated in a micro simulation model. This "top down" approach permits a disaggregated estimation of the poverty implications of alternative tax and tariff policies. The results indicate, counterintuitively, that the increase in the sales tax leads to milder average increases in poverty than an equal-yield corporate income tax, because the fall in capital investment resulting from the corporate tax increase lowers the marginal product of labor. The simulated tariff increase raises poverty slightly more than the sales tax increase and slightly less than the corporate tax increase. The difference in simulated poverty impacts is small, as the average headcount rate increases by half a percentage point more under the corporate income tax than the sales tax, confirming the limits of indirect taxation as a tool for redistributing income.*

## Introduction

Many countries, particularly in the developing world, suffer both from low living standards and unsustainable fiscal deficits. Accordingly, attempts are often made to increase public revenues, while at the same time trying to minimize the impact of these revenue increases on the poor. The general intuition is often that increases in regressive taxes, such as the sales



[1] This paper was written as part of a World Bank project on fiscal policy and poverty alleviation in Pakistan.

tax, will have a more negative impact upon the poor than will increases in taxes perceived to be progressive, such as the corporate income tax. This paper analyzes the problem of how to increase tax revenues while trying to minimize the impact of this revenue increase on the poorest segment of society. We use a numerical analysis calibrated and applied to Pakistan, a country where moderate poverty is widespread -- 45 percent of the population was estimated to live on less than $3.10 per day in 2010/11 -- and that also suffers from very poor public revenue performance. Our results will indicate that the standard intuition, at least in this case, may not be correct once indirect effects are taken into account.

Pakistan is in a delicate fiscal situation, with a budget deficit of around 5.8 percent of GDP for 2014 and with tax revenues amounting to only 10.3 percent of GDP. Tax reform is therefore high on the political agenda.[2] Although reforms may seek to raise revenue or improve efficiency, in particular by reducing tax evasion, changes in the tax code will also affect the income distribution and the welfare of households. The objective of this paper is to shed light on the potential distributional effects of tax reforms in Pakistan, by linking the output of a Computational General Equilibrium (CGE) models to a nationally representative household survey (the 2010/11 Pakistan Standard of Living Measurement Survey, PSLM). A top-down approach is utilized, in which the macro and sectoral outputs of the CGE model are used as inputs into micro-simulations.[3] A particular characteristic of the CGE model is that it incorporates tax evasion as an endogenous outcome of optimizing behavior by the corporate

[2] Fiscal data obtained from the World Bank's Spring 2014 South Asia Economic Focus *Time to Refocus*.

[3] This is a commonly used approach in trying to analyze the impact of fiscal policy such as taxes and tariffs on heterogeneous consumer groups (See Feltenstein, Lopes, Porras-Mendoza, and Wallace, 2014 for a survey).

sector. Given Pakistan's relatively low rate of overall tax collection, as well as high statutory tax rates, it is important to include evasion in the model.

Our paper is structured as follows. The next section will review the relevant literature on tax evasion in the context of general equilibrium models, while Section III will develop the dynamic computational general equilibrium (CGE) model that we use to analyze tax changes at the macro level. The next section will give the numerical results of the simulations of alternative tax policies in the CGE model. Section 5 will discuss the micro simulation model that links the CGE macro results to poverty analysis, and will present the poverty outcomes of alternative tax regimes. The final section will conclude.

## II. Modeling Tax Evasion[4]

Pakistan has severe problems with tax evasion. In particular, apart from having a poor tax collection effort, Pakistan has faced a steadily declining tax to GDP ratio. In recent years, tax collection has come down from 10.9 percent of GDP in 2003 to around 9 percent of GDP in 2012. Widespread evasion is reported; for example, only 2 percent of the working age population pays personal income taxes (Kleven and Waseem, 2013). Additionally, a study in 2011 found that out of the 46000 registered firms, only around 24000 filed corporate income tax returns.[5] Thus Pakistan provides a case study of a country in which there are both high degrees of tax evasion, as well as a steadily declining tax effort.

[4] The section is derived from Feltenstein and Cyan (2013).
[5] This study was carried out by the International Center for Public Policy, Andrew Young School of Policy Studies in 2011 to develop a micro-simulation model for the Federal Board of Revenue, Pakistan.

We confine our analysis of tax evasion to business's evasion of the corporate income tax.[6] We model the cost of operating in the underground economy in terms of the inability to borrow from the official banking system. Banks in the model are assumed not to have perfect information about the firm's true ownership of assets and its associated true tax obligation. We assume that due to collateral requirements, credit is provided only in relation to the firm's implied ownership of assets, which is determined from its actual tax payment. The idea here is that in the face of default, banks can only seize those assets that have been officially declared by the firm. Hence, the higher the extent of tax evasion, the lower the implied value of firm assets, and the lower the amount of credit provided by the banking system. Our approach has some similarity to Kiyotaki and Moore (1997) who model credit limits on loans. These limits are determined by estimates of collateral which, in turn, are determined by estimates of durable asset holdings by borrowers. Here, tax payments are used to estimate the value of the durable asset of the borrower, as the asset cannot be directly observed.

We assume that firms can operate partially in the formal and partially in the underground economy. That part of their operation that takes place in the legal economy pays taxes and can borrow from the banking system. That part that is underground does not pay taxes and cannot borrow. Admittedly this distinction is artificial, but captures some of the benefits and costs of operating in the underground economy discussed in the literature.

Our approach also assumes that firms can evade taxes without any real risk of detection or punishment. Shleifer and Vishny (1993) point out that where public pressure on corruption or the enforcement ability of the government is relatively weak - as is the case in many developing

[6] There are, of course, many other forms of tax evasion. There might be evasion of the personal income tax, as well as under-invoicing of the sales tax. We will emphasize the corporate income tax since is generally the most problematic source of tax revenue.

countries - this is in fact an appropriate assumption. Of course the specific case of Pakistan may well deviate from this general assumption, as variable enforcement of tax collection in different sectors of the economy may occur. Such differential levels of enforcement could impact revenue collections across sectors, independently of access to credit issues. However we lack information on differential tax enforcement, and hence have not attempted to incorporate it in our stylized model.

## III. A General Equilibrium Specification

In this section we develop the formal structure of a dynamic general equilibrium model that endogenously generates an underground economy. Much of the structure of our model is designed to permit numerical implementation for Pakistan. Our model has *n* discrete time periods. All agents optimize in each period over a 2 period time horizon. That is, in period $t$ they optimize given prices for periods $t$ and $t+1$ and expectations for prices for the future after $t+1$. When period $t+2$ arrives, agents re-optimize for period $t+2$ and $t+3$, based on new information about period $t+2$.

**Production**

There are 8 factors of production and 3 types of financial assets:

| | | | |
|---|---|---|---|
| 1-5 | Capital types | 9. | Domestic currency |
| 6. | Urban labor | 10. | Bank deposits |
| 7. | Rural labor | 11. | Foreign currency |
| 8. | Land | | |

The five types of capital correspond to five aggregate nonagricultural productive sectors. These sectors are:

SECTOR 1=LIGHT MANUFACTURING
SECTOR 2=HEAVY INDUSTRY

SECTOR 3=ELECTRICITY,WATER, SEWAGE
SECTOR 4=TRANSPORT
SECTOR 5=HOTELS, HOUSING, HEALTH SERVICES

An input-output matrix, $A_t$, is used to determine intermediate and final production in period *t*. The matrix is 50 x 50, and is taken from *Samwalk* (2010), a 2007 social accounting matrix developed for Pakistan by the International Food Policy Research Institute (See Debowicz, et al, 2013 for details). The first 50 rows and columns of the input-output matrix correspond to domestic production. The final row and column represents imports of intermediate and final goods, which are treated as a single aggregate commodity. Corresponding to each sector in the input-output matrix, sector-specific value added is produced using capital and urban labor for the nonagricultural sectors, and land and rural labor in agriculture.

The specific formulation of the firm's problem is as follows. Let $y_{Ki}^{j}$, $y_{Li}^{j}$ be the inputs of capital and urban labor to the *j*th nonagricultural sector in period *i*. Let $Y_{Gi}$ be the outstanding stock of government infrastructure in period *i*. The production of value added in sector *j* in period *i* is then given by:

$$va_{ji} = va_{ji}(y_{Ki}^{j}, y_{Li}^{j}, Y_{Gi}) \tag{1}$$

where we suppose that public infrastructure may act as a productivity increment to private production.

Sector *j* pays income taxes on inputs of capital and labor, given by $t_{Kij}$, $t_{Lij}$ respectively, in period *i*. The interpretation of these taxes is that the capital tax is a tax on firm profits, while the labor tax is a personal income tax that is withheld at source. There are no pure profits here, since production functions are constant returns to scale, and hence the corporate income tax is treated as a tax on returns to capital.

We suppose that each type of sectoral capital is produced via a sector-specific investment technology that uses inputs of capital and labor to produce new capital. Investment is carried out by the private sector and is entirely financed by domestic borrowing

Let us define the following notation:

$C_{Hi}$ = The cost of producing the quantity H of capital of a particular type in period *i*.

$r_i$ = The interest rate in period *i*.

$P_{Ki}$ = The return to capital in period *i*.

$P_{Mi}$ = The price of money in period *i*.

$\delta_i$ = The rate of depreciation of capital.

Suppose, then, that the rental price of capital in period 1 is $P_1$. If $C_{H1}$ is the cost-minimizing cost of producing the quantity of capital, $H_1$, then the cost of borrowing must equal the present value of the return on new capital. Hence:

$$C_{H1} = \sum_{i=2}^{n} \left[ \frac{P_{Ki}(1-\delta)^{i-2} H_1}{\prod_{j=1}^{i-1}(1+r_j)} \right] \tag{2}$$

where $r_j$ is the interest rate in period j, given by:

$$r_j = 1/P_{Bj}$$

where $r_j$ is the price of a bond in period *j*. The tax on capital is implicitly included in the investment problem, as capital taxes are paid on capital as an input to production.

The decision to invest depends not only on the variables in the above equation, but also upon the decision the firm makes as to whether it should pay taxes. This decision determines the firm's entry into the underground economy. We assume that the firm's decision is based upon a

comparison of the tax rate on capital with the rate of return on new capital. Formally, suppose that we were in a two period world. Suppose that:

$$\frac{P_{K2}}{1+r_1} \geq t_{K1}$$

that is, the present value of the return on one unit of new capital is greater than the current tax rate on capital. In this case we assume the investor pays the full tax rate on capital inputs. Suppose, on the other hand, that:

$$\frac{P_{K2}}{1+r_1} \leq t_{K1}$$

Here the discounted rate of return is less than the tax rate. The extent to which the firm goes into the underground economy is determined by the gap between the tax rate and the rate of return to investment. That is, the firm pays a tax rate of $\bar{t}_{K1}$ where:

$$\bar{t}_{K1} = t_{K1}\left[1-\left(\frac{t_{K1}-\frac{P_{K2}}{1+r_2}}{t_{K1}}\right)\right]^{\alpha} \qquad (3)$$

Here $0 \leq \alpha$ and higher values of $\alpha$ lead to lower values of taxes actually paid. That is, the ratio $\frac{\bar{t}_{K1}}{t_{K1}}$ reflects the share of the sector that operates in the above ground economy. Hence $\alpha$ represents a firm-specific behavioral variable. An "honest" firm would set $\alpha = 0$, while a firm that is prone to evasion would have a high value for $\alpha$.

**Banking**

We will suppose that there is one bank for each nonagricultural sector of the economy. There are 5 such sectors, and hence 5 banks, corresponding to each of the aggregate capital stocks.

Each bank lends primarily to the sector with which it is associated. The banks are, however, not fully specialized in the sector they correspond to. We make the simplifying assumption that each bank holds a fixed share of the outstanding debt of its particular sector. It then holds additional fixed shares of the debt of each of the remaining sectors. We make this assumption of diversification of assets in order to allow for a situation in which a firm that evades taxes, and thereby enters the underground economy, might receive varying degrees of credit rationing from the different banks to which it applies for loans.

Our premise is that banks have no direct way of knowing whether specific firms operate in the underground economy. We assume that banks only care about the amount of capital that they estimate the firm may have. If the firm defaults on its loan, then this represents the best estimate of the amount that the bank could seize. The bank would, presumably, be willing to lend an amount equal to at least the estimated firm capital.

We assume the borrower is required to show the bank his tax returns in order to obtain a loan. There is a single, flat corporate tax rate that the borrowing firm faces. Hence, suppose that $T_{K1}$ represents taxes actually paid by the borrower in period 1. This is known to the bank, as the potential borrower is required to present his tax returns. Thus if the borrower fully complied with his tax obligation, and hence carried out no underground activity, the value of his capital, $\hat{K}_1$ , would be given by:

$$\hat{K}_1 = \frac{T_{K1}}{t_{K1}}$$

In this case the bank lends an amount $L_1$, where $L_1 < C_{H1}$, as the bank would not be able to seize the full value of the loan in the case of a default. The situation we have described would, in the case of perfect certainty, have credit rationing when the estimated value of the firm's capital

is less than its loan request. If the firm's capital is greater than its loan request, there would be no credit rationing.

In a more realistic case of uncertainty about both the true value of the firm, as well as about the bank's own ability to seize the firm, one might expect the lending process to be somewhat different. Accordingly, we will suppose that a simple functional form determines bank lending as a function of the amount requested as well as the estimated value of the firm's capital. We define the amount the bank lends, $L_1$, as:

$$L_1 = C_{H1}\left[\frac{\frac{\widehat{K}_1}{C_{H1}}}{1+\frac{\widehat{K}_1}{C_{H1}}}\right]^{\gamma} = C_{H1}\left[\frac{\widehat{K}_1}{C_{H1}+\widehat{K}_1}\right]^{\gamma} \qquad (4)$$

Here $\gamma$ represents a measure of risk aversion by the bank. If $\gamma = 0$, there are no credit restrictions, and the bank ignores estimates of the borrower's estimated net worth. As $\gamma$ rises, the bank increasingly restricts lending if the term in brackets is less than 1. Thus if a firm operates entirely in the underground economy it will not be able to borrow to finance investment. If banks are highly risk averse, they will never lend more than a firm's estimated net worth, which is based on its tax return. This tax return therefore represents all the information the bank needs in order to determine its response to a request for a loan.

**Consumption**

There are 18 different consumer categories, each of which has either urban or rural labor, initial allocations of the 5 capital types, and land. They also have initial allocations of financial

assets; money, bonds, and foreign exchange. The 18 categories are taken from the SAM for Pakistan (SAMWALK 2010). They are given by:

1. Urban quintile 1
2. Urban quintile 2
3. Urban other
4. Medium farm Sindh
5. Medium farm Punjab
6. Medium farm Other Pakistan
7. Small farm Sindh
8. Small farm Punjab
9. Small farm Other Pakistan
10. Landless Farmer Sindh
11. Landless Farmer Punjab
12. Landless Farmer Other Pakistan
13. Waged rural landless farmers Sindh
14. Waged rural landless farmers Punjab
15. Waged rural landless farmers Other Pakistan
16. Rural non-farm quintile 1
17. Rural non-farm quintile 2
18. Rural non-farm other

The consumer classes have differing Cobb-Douglas demand functions with weights derived from the SAM consumption data. Endowments are similarly taken from the SAM. The consumers maximize intertemporal utility functions, which have as arguments the levels of consumption and leisure in each of the two periods.

Formally, the consumer's problem is then given by equation 5.[7] The definition of the notation follows.

$$\text{Max } U(x), \quad x = (x_1, x_{Lu1}, x_{Lr1}, x_2, x_{Lu2}, x_{Lr2}) \tag{5}$$

such that:

[7] See Feltenstein and Shamloo (2013) for a discussion of this modeling approach.

$$(1+t_i)P_i x_i + P_{Lui}x_{Lui} + p_{Lri}x_{Lri} + P_{Mi}x_{Mi} + P_{Bi}x_{Bi} + e_i P_{Bfi}x_{Bfi} = C_i \quad (5a)$$

$$P_{K1}K_0 + P_{A1}A_0 + P_{Lu1}L_{u1} + P_{Lr1}L_{r1} + P_{M1}M_0 + r_0 B_0 + P_{B1}B_0 + e_1 P_{BF1}B_{F0} + TR_1 = N_1$$

$$P_{K2}(1-\delta)K_0 + P_{A2}A_0 + P_{Lu2}L_{u2} + P_{Lr2}L_{r2} + P_{M2}x_{M1} + r_1 x_{B1} + e_2 P_{BF2}x_{BF1} + TR_2 = N_2$$

$$C_i = N_i$$

$$\log P_{Bi}x_{Bi} - \log e_i P_{BFi}x_{BFi} = \alpha + \beta(\log r_i - \log \frac{e_{i+1}}{e_i} r_{Fi}) \quad (5b)$$

$$\log(L_{ui}/L_{ri}) = a_1 + a_2 \log \frac{P_{Lui} - P_{Lri}}{P_{Lui} + P_{Lri}} \quad (5c)$$

$$\log P_{Mi}x_{Mi} = a + b\log(1+t_i)P_i x_i \quad (5d)$$

$$P_{B2}x_{B2} = d_0 + d_1(1+t_2)P_2 x_2 + d_2\left[\frac{r_2 - \pi_2}{1+\pi_2}\right] \quad (5e)$$

where:

$P_i$ = price vector of consumption goods in period *i.*

$x_i$ = vector of consumption in period *i.*

$C_i$ = value of aggregate consumption in period *i* (including purchases of financial assets).

$N_i$ = aggregate income in period *i* (including potential income from the sale of real and financial assets).

$t_i$ = vector of value added tax rates in period *i.*

$P_{Lui}$ = price of urban labor in period *i.*

$L_{ui}$ = allocation of total labor to urban labor in period *i.*

$x_{Lui}$ = demand for urban leisure in period *i.*

$P_{Lri}$ = price of rural labor in period *i.*

$L_{ri}$ = allocation of total labor to rural labor in period *i.*

$x_{Lri}$ = demand for rural leisure in period *i*.

$a_2$ = elasticity of rural/urban migration.

$P_{Ki}$ = price of capital in period *i*.

$K_0$ = initial holding of capital.

$P_{Ai}$ = price of land in period *i*.

$A_0$ = initial holding of land.

$\delta$ = rate of depreciation of capital.

$P_{Mi}$ = price of money in period *i*. Money in period 1 is the numeraire.

$x_{Mi}$ = holdings of money in period *i*.

$P_{Bi}$ = discount price of a certificate of deposit in period *i*.

$\pi_i$ = domestic rate of inflation in period *i*.

$r_i, r_{Fi}$ = the domestic and foreign interest rates in period *i*.

$x_{Bi}$ = quantity of bank deposits, that is, CD's in period *i*.

$e_i$ = the exchange rate in terms of units of domestic currency per unit of foreign currency in period *i*.

$x_{BFi}$ = quantity of foreign currency held in period *i*.

$TR_i$ = transfer payments from the government in period *i*.

a, b, $\alpha$, $\beta$ = estimated constants.

$d_i$ = constants estimated from model simulations.

**The Government**

The government collects personal income, corporate profit, and value-added taxes, as well as import duties. It pays for the production of public goods, as well as for subsidies. In addition, the government must cover both domestic and foreign interest obligations on public debt. The resulting deficit is financed by a combination of monetary expansion, as well as domestic and foreign borrowing

**The Foreign Sector**

The foreign sector is represented by a simple export equation in which aggregate demand for exports is determined by domestic and foreign price indices, as well as world income. The specific form of the export equation is:

$$\Delta X_{n0} = \sigma_1 \left[ \frac{\pi_1}{\Delta e_i + \pi_{Fi}} \right] + \sigma_2 \Delta y_{wi}$$

where the left-hand side of the equation represents the change in the dollar value of exports in period *i*, $\pi_i$ is inflation in the domestic price index, $\Delta e_i$ is the percentage change in the exchange rate, and $\pi_{Fi}$ is the foreign rate of inflation. Also, $\Delta y_{wi}$ represents the percentage change in world income, denominated in dollars. Finally, $\sigma_1$ and $\sigma_2$ are corresponding elasticities.

Imports are treated as a single aggregate good produced by the foreign sector. Consumption demand for imports is determined as part of the consumer's demand given by equation (5), in which consumers have an elasticity of demand for imported goods. Thus imports are both intermediate and final goods, with intermediate demand being generated by the input-output matrix and final demand coming from consumer optimization.

## IV. Simulations of the Pakistan General Equilibrium Model

**Benchmark Simulation**

After having calibrated our model to historical Pakistan macro data, we carry out an out of sample simulation based upon 2012. That is, we assume that all fiscal policy parameters (tax rates, real public core spending, and deficit financing rules) remain constant for the 8 years of the simulation. We assume that the country runs a managed exchange rate, and arbitrarily assume that the exchange rate is devalued by 6 percent per year. At the same time we assume that the world inflation rate is 4 percent annually and world growth is 2 percent per year.[8] The model is then run forward for 8 periods and generates a set of macro-economic variables. In addition, year by year real incomes are calculated for each of the 18 household categories. The results for this simulation are given in Appendix Table 1. We see that annual real growth averages 3.8 percent. The average inflation rate is 10.5 percent over the same 8 year forward looking time horizon. Thus the forward looking growth rate is roughly in line with the current Pakistan growth rate, while the future inflation rate is somewhat higher than the current rate. We see that the budget deficit stabilizes at approximately 5.5 percent of GDP, after starting out quite high.[9] This is somewhat higher than the current budget deficit, as might be expected since we assume no change in tax or expenditure patterns. Finally, the trade deficit starts off at 4.7 percent of GDP, in line with its current value, and then gradually improves to become a small surplus by the end of the simulation. This outcome is a result of our assumed rate of future devaluation combined with the assumptions for world growth and inflation.

If we turn to the next part of the table, showing real consumption by sectors, we see that almost all sectors exhibit growth over the 8 periods, although there are exceptions. Thus, for

[8] These numbers are, of course, arbitrary but are needed to generate the behavior of trade.
[9] This is probably due to our attributing some of the stock of private debt to the public sector, as these debts are sometimes difficult to differentiate in the data.

example, waged rural landless farmers Punjab suffer income losses over the simulation, as does the category medium farm other Pakistan. The overall average growth rate of real consumption is 4.2 percent, and the urban sector experiences average annual consumption growth of 4.7 percent while the rural sector grows by 3.9 percent. The baseline simulation itself should not be attributed as a forecast of the future. Rather, they should be used in comparison to the counterfactual examples which will come next.

**17 Percent Sales Tax**

As our first counterfactual simulation we will suppose that the sales tax is increased from 16 percent in the base case to 17 percent as part of an attempt to improve tax collection. The results are given in Appendix Table 2. We see that the average share of revenues to GDP rises from 20.9 percent to 21.5 percent. At the same time, real GDP declines by 0.5 percent and inflation also declines slightly. It is interesting to note that there is a decline in tax compliance, as compared to the base case, as the increased sales tax has lowered the profitability of investment. Average annual consumption growth across all households decreases from 4.2 percent in the base case to 4.0 percent here. Although both urban and rural sectors suffer slight declines in their average annual real consumption growth rates, the relative deterioration is greater in the rural sector, 3.9 to 3.7 percent, than in the urban sector, 4.7 to 4.6 percent.

**45 Percent Corporate Income Tax Rate**

As a further experiment, suppose we ask what would happen if we try to use a corporate income tax rate increase to achieve the same increase in tax revenue as was brought about by the 17 percent sales tax. Such an equivalent increase cannot be derived analytically, but must be determined by repeated simulations with different capital tax rates. As shown in Table 3, an increase in the corporate income tax from 35 to 45 percent leads to an average tax to GDP ratio

of 21.5 percent, which is precisely that which was generated by the 17 percent sales tax rate. At the same time, as might be expected, there is a significant deterioration in tax compliance, as the tax increase reduces the return to capital. Final period capital stocks are also lower across all sectors, leading to a reduced marginal product of labor.

The negative impact of the corporate tax increase causes overall real household consumption to grow by 3.8 percent as an annual average, which is considerably lower than the 4.0 percent annual growth rate that it experienced under the 17 percent sales tax rate. Rural consumption growth suffers disproportionately, as average growth slows to 3.3 percent, down from 3.6 percent with the 17 percent sales tax. Urban consumption growth actually increases slightly, from 4.6 to 4.7 percent. This is largely due to the fact that the interest rate declines with the increased corporate income tax. The urban sector holds a preponderance of the stock of public and private debt and hence realizes an income increase from the capital gains on their bond holdings. We may thus conclude that, from a macro point of view, the 17 percent sales tax rate is superior to the 45 percent corporate income tax rate in generating the same 21.5 percent tax to GDP ratio.

**19 Percent Tariff**

As a final example, we will experiment with a 5 percentage point increase in the tariff rate on imports, increasing it from 14 to 19 percent. The results of this simulation are given in Table 4. We see that the real growth rate is slightly lower than in either the base case or either of the counter-factual tax simulations. The average tax to GDP ratio, 21.4 percent, is lower than for either the 17 percent sales tax or the 45 percent corporate income tax simulations. At the same time, the average overall household real consumption growth rate is 3.4 percent, which is the same as with the 45 percent corporate income tax, although lower than with the 17 percent sales

tax. It is interesting to note that the tariff increase impacts the urban sector more negatively than any of the 2 previous tax simulations, causing real consumption to grow by only an average of 4.4 percent, which is also considerably lower than the growth rate in the base case also. Finally, the tariff increase has relatively little impact on the rates of tax evasion. This is intuitively clear, as imports are not domestically produced, so the increased tariff rate has little impact upon the rate of return to capital.

It would thus appear that for the macro economy the 17 percent sales tax has the best overall outcome of the various counter-factual policies. The 45 percent corporate income tax rate, which generates the same overall tax to GDP ratio as does the 17 percent sales tax, produces lower real GDP in all but the final period than does the sales tax increase. In addition, average real household income growth is lower with the corporate income tax increase than it is with the sales tax increase. Thus a modest sales tax increase would appear to be our choice among revenue equivalent tax changes, if we consider only macro aggregates. If we turn to poverty indicators, we find certain additional results. This will be the subject of the next section.

## V. Poverty Calculations

As noted in the previous section, three particular changes to the tax code are considered:, a one percentage point increase in the General Sales Tax, a ten percentage point increase in the corporate tax rate, and a five percentage point increase in the tariff rate. Changing the corporate tax rate from 35 to 45 percent, and changing the GST from 16 to 17 percent are revenue equivalent policies. In particular, they both increase revenue by 0.6 percentage points of GNP, from 20.9 percent in the baseline to 21.5 percent of GNP. Raising the tariff to 19 percent, from 14 percent, increases revenue by only 0.5 percentage points of GNP, while having a less favorable macro outcome than do the two domestic tax increases.

In this section we allow the endogenous outputs of the CGE model, in particular the series of real consumption indices reported in Appendix Tables 1-4, to be entered as data inputs to our micro-simulation model of Pakistan households. We report the simulated effects of the tax reforms on two outcomes: 1) the average change in real consumption for each quintile (incidence), as well as the share of the benefits or burden accruing to each quintile of the consumption distribution (targeting performance), 2) the poverty rate, as compared to the baseline case. In order to calculate these outcomes, we apply the CGE generated growth rates in real household consumption uniformly within the corresponding household groups in the 2010-11 Pakistani Social and Living Standards Measurement Survey (PSLM) to simulate the effect of the four reforms.[10] In each case, we compare the effects under the reform to the baseline scenario to assess the effects on household welfare, following a "top down" procedure in which the endogenous outcomes generated by the CGE model are fed into a micro-simulation model (MSM). The per adult-equivalent consumption of each household in the PSLM is adjusted according to the percentage increase or decrease in consumption for their household group.[11] This approach has been used extensively as a way of connecting the more aggregate outputs of CGE models with the detailed household data available in MSM models. A survey of such models is given in Feltenstein, Lopes, Porras-Mendoza, and Wallace (2014).

**Incidence and Targeting**

[10] The growth rate we use is the average growth rate of the simulated real income produced by the model in periods one through eight.

[11] Pakistan uses an adult-equivalence scale that assigns a weight of 0.8 to individuals younger than 18 years old and 1 for all others.

First, we examine the implications of the model in terms of the incidence and targeting implications of the three proposed tax increases. Appendix Table 5 shows the average change in real consumption for each expenditure quintile under the alternative scenarios, in comparison to the baseline. As mentioned above, the base case generates highest overall growth rate in real consumption. Of the alternative tax policies, raising the sales tax gives the highest growth rate in real consumption. Thus the average annual growth rate in real consumption is 0.2 percentage points higher with the 17 percent sales tax than it is with the 45 percent corporate income tax. It is useful to look at the relative impacts of these alternative tax policies on different welfare categories. If we look at Appendix Table 5, we note that for all three of the counter-factual tax scenarios the greatest deviation from the baseline simulation is realized by the bottom quintile of households, that is, the poorest 20 percent of the population. On the other hand, the disparity between the loss in consumption suffered by the bottom 20 percent and the highest is lowest for the simulated sales tax increase, while it is largest for the corporate tax increase. At the same time the absolute loss, is smallest for all quintals for the sales tax increase and largest for the tariff increase, with the lowest quintal being impacted especially severely. This result is explained by the fact that the higher sales tax has a relative price effect that impacts all income categories in a fairly uniform way. The corporate income tax, on the other hand, lowers interest rates significantly (see Appendix Tables 2, 3) so that holders of capital and bonds, largely upper income households, realize a capital gain. At the same time, the end of period sectoral capital stocks are considerably lower with the corporate income tax than with either of the other simulations (Appendix Tables 1-4), so that the marginal product of labor is also lower. This reduces marginal product, and hence wages, which tends to impact the poorest households most

severely since most of their income comes from labor. These results suggest that the sales tax increase is welfare superior to the equal tax yield capital tax increase.

It is interesting to note that raising tariffs by 5 percentage points does not yield as much revenue as either the sales or corporate tax increases, yet also reduces household consumption for all income levels of society more than the other two tax regimes. At the same time the tariff increase has a relatively greater negative impact upon the wealthiest 20 percent of households than do the other tax changes, as the average growth rate of real consumption for this quintal is 7.35 percent lower than in the base case (Appendix Table 5), which is almost as great as the decline in consumption for the lowest quintal. The richest quintal consumes a larger fraction of its total consumption bundle from imports than do other household groups and, accordingly suffers more than all but the poorest from the tariff increase.

**Poverty Rates**

Over the past 15 years, Pakistan has made important progress in reducing poverty. According to the most recent official estimates, the incidence of poverty decreased from 34.4 percent in 2000/01 to 12.4 percent in 2010/2011 (See Figure 1).[12] After a temporary setback between 1999 and 2002, poverty resumed its rapid decline and fell to around 24 percent of the total population in 2004/05 and slightly further to 17.2 percent in 2007/08. Poverty has declined

[12] Poverty estimates are taken from the Pakistan Economic Survey 2013-14. The 2007-08 and 2010-11 figures are interim estimates, pending the recommendations of a technical group on poverty.

in both urban and rural areas, although the headcount rate remains over twice as high in the latter as in the former (15.1 percent vs. 7.1 percent).

Pakistan's poverty is determined using a standard methodology. The official poverty line used was defined as 723.4 for 2000-01 based on a food energy intake approach, using a minimum caloric intake of 2350 calories per adult equivalent per day. (International Monetary Fund, 2010). The poverty line has subsequently been updated using the inflation rate from the Consumer Price Index (CPI). The inflated poverty lines are applied to per adult consumption data from the integrated household study known as the Pakistan Social and Living Standards Measurement (PSLM) Survey. This survey is collected by the Pakistan Bureau of Statistics over an entire year, at least once every three years.[13]

Despite the use of standard methods, poverty measurement in Pakistan is the subject of ongoing controversy regarding the limitation of the current methodology.[14] Much attention has been focused on arguments over the accuracy of the poverty headcount rate, which has diverted attention from the underlying factors driving poverty and the programs that might improve the welfare of the poor Questions have been raised about the appropriateness of using the CPI to deflate the poverty line, because the reference basket is based on a typical urban household, which spends a lower share of its budget on food than poor households in the PSLM. Since food prices have been rising more than non-food prices, using the CPI could underestimate the actual price increases faced by the poor. Second, the most recent population census was carried out in 1998, and the lack of a more recent sampling frame makes recent rounds of the PSLM less

[13] The first integrated household survey was implemented in 1998-99. Since then, consumption data was collected in 2001-02, 2004-05, 2005-06, 2007-08, and 2010-11, and the consumption module has experienced only minor changes.

[14] This discussion draws heavily on World Bank Group (2014), p.103-104

representative of the national population. In addition, it is particularly difficult to collect data in the province of Baluchistan because it is a vast territory with a highly dispersed population. Finally, the poverty line has not been updated in several years, and the current one may not accurately reflect the consumption patterns of poor Pakistani households.[15] These are important methodological issues that should be addressed, but they are unlikely to have major effects on the simulated effects of changes to the tax code on poverty rates.

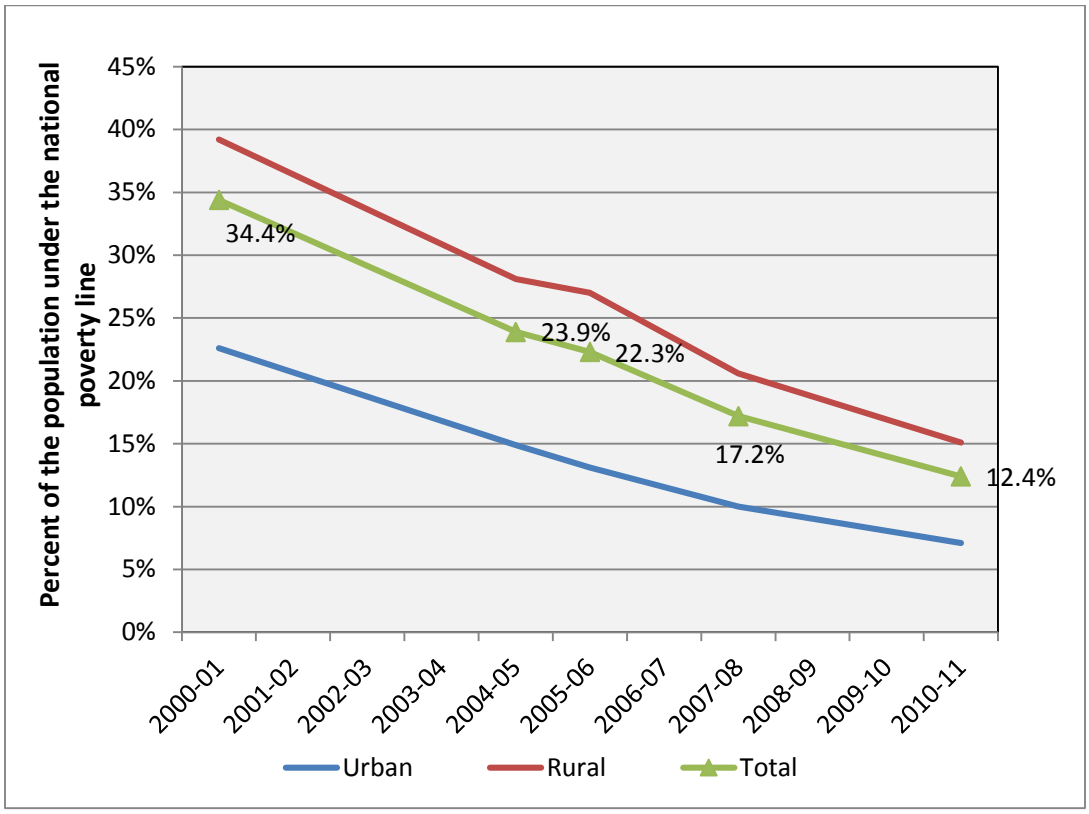
How do the simulated tax reforms affect poverty in the model? For each of the four tax reform scenarios Appendix Table 6 presents estimates of the percentage point change in poverty headcount relative to the baseline. A rise in the sales tax rate causes the share of the population in poverty to increase by an average of 0.23 percentage points over the 8 years of the simulation, as compared to the baseline. When the higher corporate tax is imposed, the share of the population in poverty is, on average, 0.61 percentage points higher than in the base case while, in the case of the tariff increase, the average poverty share is 0.37 percentage points higher than in the base case. The reasons for these differential impacts upon poverty are essentially the same as those that explain the consumption changes. The increase in the corporate tax rate severely lowers the rate of capital formation, thereby reducing the marginal product of labor and thereby causing all sectors of society, but especially the poor, to realize a negative income effect. Hence poverty increases relative to the base case. The negative relative price impact on poverty from the 5 percentage point increase in the tariff rate is greater than that of the 1 percentage point sales tax rate increase. Thus, based upon the impact on poverty, we would again rank the sales tax rate increase as superior to the equal yield corporate tax increase.

[15] Additional concerns of lesser importance are the exclusion of durable goods from the poverty line and the fact that spatial deflation is based purely on food prices.

As a final measure of the relative benefits of the different tax reforms, we have also estimated inequality, as measure by the Gini coefficient. Table 7 gives the Gini coefficients for the baseline case, as well as each of the policy reform scenarios. If we consider the part of the table that shows changes in the Gini coefficient relative to the baseline, we see that inequality declines in both the case of the sales tax increase, as well as that of the corporate tax increase, although the relative changes are quite small. The decreases are initially smaller in the case of the sales tax increase than for the capital tax increase, but by the final years of the simulation the reverse is true. The tariff simulation, on the other hand, causes the Gini coefficients to increase, indicating a worsening in the measure of inequality. Thus the sales tax and revenue equivalent corporate income tax increases improve the distribution of income relative to the base case, while the tariff increase does not.

**Figure 1. Poverty Headcount Rate, 2001-2010**

Note: Author's calculation using PSLM 2001, 2004, 2007 and 2010.




*Source: Pakistan Economic Survey 2013-14*

***Conclusions***

This paper examines the potential effects of changes to the tax code on income distribution and welfare in Pakistan. It relies on a top-down approach, where the outputs of a dynamic CGE model are used as inputs into a micro-simulation model based on household data. In particular, the estimated effects on the income of 18 household categories taken from the model were applied uniformly to the per capita consumption of each group in the 2011 Pakistan Living Standards Measurement Survey. This approach imposes strong assumptions and is constrained by the nature of the Social Accounting Matrix that underpins the numerical implementation of the CGE model, as well by the structure of the CGE model itself. However, it provides a useful and logically consistent framework for considering how tax reforms may affect the poor.

The most striking result is that an equal yield increase in the corporate and sales tax rates have different impacts upon consumption and poverty in the model. These differences are minor, as the corporate tax increases raises poverty by only 0.4 percentage points more than the sales tax increase, although this still amounts to roughly 670,000 people. In the model, the increased corporate tax has to be raised by 10 percentage points to generate an equivalent yield to a 1 percentage point increase in the sales tax, which significantly lowers the rate of capital formation.[16] The resulting declines in the marginal product of labor, and the corresponding negative income effect, tends to increase poverty, relative to both the base case as well as to the case in which the sales tax rate is increased. This is consistent with Auerbach (2005), which notes that the corporate tax, to the extent it is applied to new taxes on capital income, would lower the ratio of capital to labor and decrease wages. Wages may also fall through an additional mechanisms not captured in the model, if the introduction of corporate tax lowers the amount of quasi-rents that firms share with their workers. This appears to be an important factor in the EU context (Arumapalam, et al, 2012), although it may be less of factor in Pakistan, where a large portion of poor workers are self-employed or informal.

Increasing the tariff rate by 5 percentage points does not yield the same revenue increase as the two other hypothetical changes. At the same time, the tariff increase is welfare inferior, both in terms of consumption and poverty, to the sales tax increase. None of the alternative tax scenarios generates significant income redistribution, a result that is consistent with the theoretical argument that very little income redistribution is possible through indirect taxation (Sah 1983). Ultimately, the analysis suggests that, given Pakistan's goal of increasing tax

[16] This result is partially due to the fact that the general equilibrium model incorporates endogenous tax evasion as optimizing behavior. This tax evasion causes corporate profit taxes to be relatively less effective in raising revenues than are sales taxes.

revenue, a uniform sales tax increase may ultimately be as or even slightly more pro-poor than an increase in tariffs or the corporate tax.

## APPENDIX 1: GENERAL EQUILIBRIUM SIMULATIONS

### Table 1: BASE CASE (BASED ON 2010)

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| REAL GDP | 100.0 | 100.0 | 100.1 | 103.7 | 112.6 | 116.1 | 124.5 | 130.2 |
| NOMINAL GDP | 100.0 | 120.4 | 131.4 | 148.9 | 181.8 | 199.9 | 246.0 | 261.1 |
| PRICE LEVEL | 100.0 | 120.4 | 131.2 | 143.6 | 161.4 | 172.1 | 197.6 | 200.6 |
| INFLATION | 0.0 | 20.4 | 9.0 | 9.4 | 12.4 | 6.6 | 14.8 | 1.5 |
| TAX REVENUES/GDP | 22.3 | 21.5 | 21.2 | 20.5 | 20.7 | 20.1 | 20.8 | 20.1 |
| GOV. EXPENDITURES/GDP | 36.6 | 33.6 | 30.1 | 28.5 | 27.5 | 26.5 | 26.3 | 25.8 |
| GOVERNMENT DEFICIT | -14.3 | -12.1 | -8.9 | -8.0 | -6.8 | -6.5 | -5.5 | -5.7 |
| INTEREST RATE | 21.6 | 6.3 | 5.6 | 3.9 | 4.1 | 2.6 | 2.7 | 1.6 |
| EXPORTS/GDP | 15.7 | 16.1 | 16.9 | 18.4 | 17.9 | 20.1 | 19.4 | 22.7 |
| IMPORTS/GDP | 20.5 | 20.7 | 20.3 | 19.5 | 18.4 | 17.7 | 16.9 | 16.3 |
| TRADE DEFICIT/GDP | -4.7 | -4.5 | -3.3 | -1.0 | -0.6 | 2.4 | 2.5 | 6.4 |

SHARE OF SECTOR PAYING TAXES

| PERIOD | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| SECTOR 1 | 100.0 | 100.0 | 100.0 | 100.0 |
| SECTOR 2 | 100.0 | 100.0 | 100.0 | 100.0 |
| SECTOR 3 | 100.0 | 100.0 | 100.0 | 100.0 |
| SECTOR 4 | 100.0 | 100.0 | 100.0 | 100.0 |
| SECTOR 5 | 100.0 | 100.0 | 100.0 | 100.0 |

SECTOR 1=LIGHT MANUFACTURING
SECTOR 2=HEAVY INDUSTRY
SECTOR 3=ELECTRICITY,WATER, SEWAGE
SECTOR 4=TRANSPORT
SECTOR 5=HOTELS, HOUSING, HEALTH SERVICES

| REAL CONSUMPTION (PERIOD) 1/ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Urban quintile 1 | 1.87 | 2.31 | 2.56 | 2.82 | 3.12 | 3.29 | 3.51 | 3.52 |
| Urban quintile 2 | 3.17 | 3.90 | 3.66 | 4.03 | 4.12 | 4.35 | 4.46 | 4.46 |
| Urban other | 15.45 | 19.01 | 17.19 | 18.91 | 18.97 | 20.02 | 20.29 | 20.31 |
| Med farm Sindh | 2.25 | 2.77 | 3.21 | 3.53 | 4.06 | 4.28 | 4.72 | 4.73 |
| Med farm Punjab | 12.07 | 14.85 | 11.83 | 13.02 | 12.29 | 12.97 | 12.85 | 12.86 |
| Med farm OthPak | 2.71 | 3.33 | 2.54 | 2.79 | 2.55 | 2.69 | 2.61 | 2.61 |
| Small farm Sindh | 2.05 | 2.52 | 2.01 | 2.21 | 2.08 | 2.19 | 2.16 | 2.17 |
| Small farm Punjab | 3.45 | 4.25 | 3.82 | 4.21 | 4.27 | 4.50 | 4.64 | 4.65 |
| Small farm OthPak | 1.97 | 2.42 | 2.32 | 2.55 | 2.67 | 2.82 | 2.95 | 2.96 |
| Landless Farmer Sindh | 0.72 | 0.88 | 0.87 | 0.95 | 1.01 | 1.07 | 1.14 | 1.14 |
| Landless Farmer Punjab | 0.71 | 0.87 | 0.95 | 1.04 | 1.16 | 1.23 | 1.33 | 1.33 |
| Landless Farmer OthPak | 0.25 | 0.30 | 0.34 | 0.37 | 0.42 | 0.44 | 0.48 | 0.48 |
| Waged rural landless farmers Sindh | 1.52 | 1.87 | 1.57 | 1.73 | 1.67 | 1.76 | 1.75 | 1.75 |
| Waged rural landless farmers Punjab | 2.00 | 2.46 | 1.89 | 2.07 | 1.88 | 1.99 | 1.90 | 1.90 |
| Waged rural landless farmers OthPak | 1.89 | 2.33 | 2.01 | 2.21 | 2.17 | 2.29 | 2.30 | 2.30 |
| Rural non-farm quintile 1 | 1.51 | 1.86 | 1.93 | 2.12 | 2.28 | 2.41 | 2.54 | 2.54 |
| Rural non-farm quintile 2 | 1.79 | 2.33 | 2.38 | 2.77 | 2.87 | 3.21 | 3.23 | 3.42 |
| Rural non-farm other | 4.09 | 5.04 | 4.78 | 5.26 | 5.41 | 5.71 | 6.10 | 6.10 |

1/ These should be interpreted as index numbers that have relative significance, but are not connected to current monetary values.

| SECTORAL CAPITAL<br>PERIOD 8 1/<br>(Stock; relative to base case) | |
|---|---|
| SECTOR 1 | 100.00 |
| SECTOR 2 | 100.00 |
| SECTOR 3 | 100.00 |
| SECTOR 4 | 100.00 |
| SECTOR 5 | 100.00 |

**Table 2: Sales Tax = 17%**

| YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| REAL GNP | 99.6 | 99.8 | 99.8 | 103.4 | 112.0 | 115.8 | 124.1 | 129.4 |
| Nominal GDP | 97.9 | 117.8 | 127.7 | 144.9 | 175.3 | 192.8 | 235.5 | 248.6 |
| PRICE LEVEL | 98.3 | 118.1 | 128.0 | 140.2 | 156.4 | 166.5 | 189.7 | 192.1 |
| INFLATION | 0.0 | 20.1 | 8.4 | 9.6 | 11.6 | 6.4 | 14.0 | 1.2 |
| TAX REVENUES/GDP | 23.0 | 22.3 | 21.9 | 21.2 | 21.4 | 20.7 | 21.4 | 20.6 |
| GOV. EXPENDITURES/GDP | 37.2 | 34.1 | 30.4 | 28.8 | 27.7 | 26.7 | 26.4 | 26.0 |
| GOVERNMENT DEFICIT | -14.2 | -11.8 | -8.6 | -7.6 | -6.4 | -6.0 | -5.1 | -5.4 |
| INTEREST RATE | 21.3 | 6.4 | 5.6 | 3.9 | 3.9 | 2.6 | 2.6 | 1.5 |
| EXPORTS/GDP | 16.1 | 16.5 | 17.4 | 18.9 | 18.4 | 20.7 | 20.0 | 23.6 |
| IMPORTS/GDP | 21.2 | 20.9 | 20.6 | 19.7 | 18.7 | 17.9 | 17.2 | 16.5 |
| TRADE DEFICIT/GDP | -5.2 | -4.5 | -3.2 | -0.8 | -0.2 | 2.8 | 2.8 | 7.0 |

CHANGE IN TAX COMPLIANCE FROM BASE CASE (PERCENT)

| PERIOD | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| SECTOR 1 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECTOR 2 | -4.3 | -5.5 | -7.9 | -8.5 |
| SECTOR 3 | 0.0 | -4.2 | -5.2 | -6.9 |
| SECTOR 4 | -1.5 | -1.7 | -2.1 | -3.2 |
| SECTOR 5 | -1.3 | -3.0 | -4.9 | -6.6 |

SECTOR 1=LIGHT MANUFACTURING
SECTOR 2=HEAVY INDUSTRY
SECTOR 3=ELECTRICITY,WATER, SEWAGE
SECTOR 4=TRANSPORT
SECTOR 5=HOTELS, HOUSING, HEALTH SERVICES

| REAL CONSUMPTION (PERIOD) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Urban quintile 1 | 1.85 | 2.28 | 2.54 | 2.80 | 3.09 | 3.25 | 3.49 | 3.46 |
| Urban quintile 2 | 3.16 | 3.89 | 3.64 | 4.01 | 4.09 | 4.31 | 4.44 | 4.40 |
| Urban other | 15.27 | 18.78 | 17.02 | 18.74 | 18.77 | 19.80 | 20.15 | 19.99 |
| Med farm Sindh | 2.24 | 2.75 | 3.18 | 3.50 | 4.00 | 4.22 | 4.65 | 4.62 |
| Med farm Punjab | 12.10 | 14.89 | 11.81 | 13.01 | 12.18 | 12.85 | 12.72 | 12.62 |
| Med farm OthPak | 2.72 | 3.35 | 2.54 | 2.80 | 2.53 | 2.67 | 2.59 | 2.57 |
| Small farm Sindh | 2.06 | 2.53 | 2.00 | 2.20 | 2.06 | 2.17 | 2.14 | 2.13 |
| Small farm Punjab | 3.44 | 4.23 | 3.80 | 4.18 | 4.21 | 4.45 | 4.59 | 4.55 |
| Small farm OthPak | 1.96 | 2.41 | 2.30 | 2.53 | 2.64 | 2.78 | 2.92 | 2.90 |
| Landless Farmer Sindh | 0.71 | 0.88 | 0.86 | 0.95 | 1.00 | 1.06 | 1.12 | 1.11 |
| Landless Farmer Punjab | 0.70 | 0.86 | 0.94 | 1.03 | 1.15 | 1.21 | 1.31 | 1.30 |
| Landless Farmer OthPak | 0.24 | 0.30 | 0.34 | 0.37 | 0.42 | 0.44 | 0.48 | 0.47 |
| Waged rural landless farmers Sindh | 1.52 | 1.87 | 1.57 | 1.72 | 1.65 | 1.75 | 1.74 | 1.73 |
| Waged rural landless farmers Punjab | 2.00 | 2.46 | 1.88 | 2.07 | 1.87 | 1.98 | 1.89 | 1.88 |
| Waged rural landless farmers OthPak | 1.89 | 2.33 | 2.00 | 2.20 | 2.15 | 2.27 | 2.28 | 2.27 |
| Rural non-farm quintile 1 | 1.49 | 1.84 | 1.91 | 2.11 | 2.26 | 2.38 | 2.52 | 2.50 |
| Rural non-farm quintile 2 | 1.77 | 2.30 | 2.35 | 2.75 | 2.84 | 3.17 | 3.21 | 3.37 |
| Rural non-farm other | 4.07 | 5.01 | 4.75 | 5.23 | 5.36 | 5.65 | 6.06 | 6.01 |

| SECTORAL CAPITAL (relative to base case) PERIOD 8 | |
|---|---|
| SECTOR 1 | 100.36 |
| SECTOR 2 | 100.00 |
| SECTOR 3 | 100.05 |
| SECTOR 4 | 100.07 |
| SECTOR 5 | 100.01 |

| **Table 3: Corporate tax =45%** | YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| REAL GNP | | 98.9 | 99.0 | 99.1 | 102.6 | 111.6 | 115.9 | 123.9 | 130.5 |
| Nominal GDP | | 96.7 | 114.4 | 122.0 | 136.0 | 163.3 | 176.7 | 215.0 | 224.8 |
| PRICE LEVEL | | 1.0 | 1.2 | 1.2 | 1.3 | 1.5 | 1.5 | 1.7 | 1.7 |
| INFLATION | | 0.0 | 18.1 | 6.6 | 7.6 | 10.3 | 4.2 | 13.8 | -0.8 |
| TAX REVENUES/GDP | | 23.2 | 22.4 | 21.9 | 21.2 | 21.4 | 20.6 | 21.1 | 20.4 |
| GOV. EXPENDITURES/GDP | | 37.6 | 34.9 | 30.3 | 28.9 | 27.4 | 26.6 | 26.1 | 25.9 |
| GOVERNMENT DEFICIT | | -14.3 | -12.4 | -8.3 | -7.8 | -6.0 | -6.0 | -4.9 | -5.5 |
| INTEREST RATE | | 20.0 | 5.6 | 4.8 | 3.1 | 3.3 | 2.1 | 2.2 | 1.3 |
| EXPORTS/GDP | | 16.3 | 17.0 | 17.9 | 19.9 | 18.9 | 21.7 | 20.4 | 24.3 |
| IMPORTS/GDP | | 21.3 | 21.1 | 20.8 | 19.9 | 19.0 | 18.3 | 17.6 | 17.0 |
| TRADE DEFICIT/GDP | | -5.0 | -4.0 | -2.8 | -0.1 | -0.1 | 3.4 | 2.8 | 7.4 |

CHANGE IN TAX COMPLIANCE FROM BASE CASE (PERCENT)

| PERIOD | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| SECTOR 1 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECTOR 2 | -43.9 | -47.8 | -52.0 | -54.4 |
| SECTOR 3 | -37.8 | -38.9 | -39.7 | -41.6 |
| SECTOR 4 | -38.3 | -41.1 | -42.9 | -44.0 |
| SECTOR 5 | -6.4 | -12.1 | -20.3 | -25.5 |

SECTOR 1=LIGHT MANUFACTURING
SECTOR 2=HEAVY INDUSTRY
SECTOR 3=ELECTRICITY,WATER, SEWAGE
SECTOR 4=TRANSPORT
SECTOR 5=HOTELS, HOUSING, HEALTH SERVICES

| REAL CONSUMPTION (Period) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Urban quintile 1 | 1.84 | 2.22 | 2.51 | 2.70 | 3.08 | 3.18 | 3.51 | 3.43 |
| Urban quintile 2 | 3.15 | 3.80 | 3.63 | 3.90 | 4.10 | 4.23 | 4.49 | 4.38 |
| Urban other | 15.01 | 18.09 | 16.80 | 18.06 | 18.75 | 19.32 | 20.32 | 19.86 |
| Med farm Sindh | 2.24 | 2.70 | 3.13 | 3.37 | 3.91 | 4.04 | 4.56 | 4.45 |
| Med farm Punjab | 12.19 | 14.69 | 11.77 | 12.65 | 12.10 | 12.47 | 12.61 | 12.32 |
| Med farm OthPak | 2.75 | 3.31 | 2.54 | 2.73 | 2.52 | 2.60 | 2.57 | 2.51 |
| Small farm Sindh | 2.07 | 2.49 | 2.00 | 2.15 | 2.05 | 2.11 | 2.13 | 2.08 |
| Small farm Punjab | 3.42 | 4.12 | 3.75 | 4.03 | 4.17 | 4.29 | 4.54 | 4.44 |
| Small farm OthPak | 1.96 | 2.36 | 2.28 | 2.45 | 2.61 | 2.69 | 2.89 | 2.83 |
| Landless Farmer Sindh | 0.71 | 0.86 | 0.85 | 0.91 | 0.99 | 1.02 | 1.10 | 1.08 |
| Landless Farmer Punjab | 0.70 | 0.84 | 0.93 | 1.00 | 1.13 | 1.16 | 1.29 | 1.26 |
| Landless Farmer OthPak | 0.24 | 0.29 | 0.33 | 0.36 | 0.41 | 0.42 | 0.47 | 0.46 |
| Waged rural landless farmers Sindh | 1.52 | 1.83 | 1.56 | 1.68 | 1.66 | 1.71 | 1.75 | 1.71 |
| Waged rural landless farmers Punjab | 2.01 | 2.42 | 1.88 | 2.02 | 1.88 | 1.94 | 1.91 | 1.87 |
| Waged rural landless farmers OthPak | 1.90 | 2.29 | 1.99 | 2.14 | 2.15 | 2.22 | 2.30 | 2.25 |
| Rural non-farm quintile 1 | 1.48 | 1.78 | 1.89 | 2.03 | 2.26 | 2.33 | 2.54 | 2.48 |
| Rural non-farm quintile 2 | 1.75 | 2.23 | 2.33 | 2.65 | 2.84 | 3.10 | 3.23 | 3.35 |
| Rural non-farm other | 4.05 | 4.88 | 4.71 | 5.06 | 5.32 | 5.49 | 6.06 | 5.92 |

| SECTORAL CAPITAL (relative to base case) | |
|---|---|
| PERIOD 8 | |
| SECTOR 1 | 97.88 |
| SECTOR 2 | 99.99 |
| SECTOR 3 | 92.62 |
| SECTOR 4 | 99.44 |
| SECTOR 5 | 99.26 |

| **Table 4: Tariff = 19 percent** | YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| REAL GNP | | 99.9 | 99.9 | 100.0 | 103.4 | 112.3 | 116.1 | 124.2 | 128.8 |
| Nominal GDP | | 99.8 | 119.7 | 130.4 | 147.1 | 178.8 | 196.3 | 240.8 | 251.9 |
| PRICE LEVEL | | 1.0 | 1.2 | 1.3 | 1.4 | 1.6 | 1.7 | 1.9 | 2.0 |
| INFLATION | | 0.0 | 20.1 | 8.8 | 9.1 | 12.0 | 6.1 | 14.7 | 0.9 |
| TAX REVENUES/GDP | | 22.8 | 22.0 | 21.7 | 21.0 | 21.2 | 20.5 | 21.2 | 20.5 |
| GOV. EXPENDITURES/GDP | | 36.7 | 33.7 | 30.1 | 28.6 | 27.5 | 26.5 | 26.3 | 26.0 |
| GOVERNMENT DEFICIT | | -13.8 | -11.7 | -8.4 | -7.6 | -6.3 | -6.0 | -5.0 | -5.5 |
| INTEREST RATE | | 21.3 | 6.2 | 5.5 | 3.7 | 3.8 | 2.5 | 2.5 | 1.4 |
| EXPORTS/GDP | | 14.9 | 15.3 | 16.0 | 17.5 | 17.0 | 19.2 | 18.5 | 21.9 |
| IMPORTS/GDP | | 20.5 | 20.2 | 19.8 | 19.0 | 18.0 | 17.3 | 16.5 | 15.9 |
| TRADE DEFICIT/GDP | | -5.6 | -4.9 | -3.8 | -1.5 | -1.0 | 1.8 | 1.9 | 6.0 |

CHANGE IN TAX COMPLIANCE FROM BASE CASE (PERCENT)

| PERIOD | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| SECTOR 1 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECTOR 2 | -0.7 | -2.0 | -1.8 | -5.3 |
| SECTOR 3 | 0.0 | -1.3 | -3.1 | -4.5 |
| SECTOR 4 | -0.7 | -0.7 | -0.8 | -1.8 |
| SECTOR 5 | 1.9 | -1.6 | -2.2 | -4.0 |

SECTOR 1=LIGHT MANUFACTURING
SECTOR 2=HEAVY INDUSTRY
SECTOR 3=ELECTRICITY,WATER, SEWAGE
SECTOR 4=TRANSPORT
SECTOR 5=HOTELS, HOUSING, HEALTH SERVICES

| REAL CONSUMPTION (Period) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Urban quintile 1 | 1.86 | 2.28 | 2.54 | 2.78 | 3.08 | 3.25 | 3.48 | 3.41 |
| Urban quintile 2 | 3.15 | 3.87 | 3.64 | 3.98 | 4.08 | 4.30 | 4.42 | 4.34 |
| Urban other | 15.34 | 18.82 | 17.06 | 18.67 | 18.78 | 19.78 | 20.13 | 19.74 |
| Med farm Sindh | 2.23 | 2.74 | 3.18 | 3.48 | 4.00 | 4.21 | 4.66 | 4.57 |
| Med farm Punjab | 11.99 | 14.71 | 11.75 | 12.85 | 12.15 | 12.79 | 12.71 | 12.47 |
| Med farm OthPak | 2.69 | 3.30 | 2.52 | 2.76 | 2.52 | 2.66 | 2.58 | 2.53 |
| Small farm Sindh | 2.04 | 2.50 | 1.99 | 2.18 | 2.05 | 2.16 | 2.14 | 2.10 |
| Small farm Punjab | 3.42 | 4.20 | 3.79 | 4.14 | 4.21 | 4.43 | 4.59 | 4.50 |
| Small farm OthPak | 1.95 | 2.40 | 2.30 | 2.51 | 2.64 | 2.78 | 2.92 | 2.86 |
| Landless Farmer Sindh | 0.71 | 0.87 | 0.86 | 0.94 | 1.00 | 1.05 | 1.12 | 1.10 |
| Landless Farmer Punjab | 0.70 | 0.86 | 0.94 | 1.03 | 1.15 | 1.21 | 1.31 | 1.29 |
| Landless Farmer OthPak | 0.24 | 0.30 | 0.34 | 0.37 | 0.42 | 0.44 | 0.48 | 0.47 |
| Waged rural landless farmers Sindh | 1.51 | 1.85 | 1.56 | 1.70 | 1.65 | 1.74 | 1.74 | 1.70 |
| Waged rural landless farmers Punjab | 1.98 | 2.43 | 1.87 | 2.05 | 1.86 | 1.96 | 1.88 | 1.85 |
| Waged rural landless farmers OthPak | 1.88 | 2.30 | 1.99 | 2.18 | 2.14 | 2.25 | 2.28 | 2.23 |
| Rural non-farm quintile 1 | 1.50 | 1.83 | 1.91 | 2.09 | 2.26 | 2.38 | 2.51 | 2.46 |
| Rural non-farm quintile 2 | 1.77 | 2.30 | 2.36 | 2.73 | 2.84 | 3.16 | 3.21 | 3.32 |
| Rural non-farm other | 4.06 | 4.98 | 4.74 | 5.19 | 5.35 | 5.63 | 6.05 | 5.93 |

| SECTORAL CAPITAL (relative to base case) | |
|---|---|
| PERIOD 8 | |
| SECTOR 1 | 99.9 |
| SECTOR 2 | 100.0 |
| SECTOR 3 | 99.5 |
| SECTOR 4 | 100.1 |
| SECTOR 5 | 100.0 |

**Table 5**
**Consumption under Alternative Tax Regimes**

| **Baseline** | | | | | Survey year | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | |
| Quintile | | | | | | | | | | Average % change |
| | 1 | 1622.9 | 1999.8 | 1826.6 | 2011.4 | 2015.2 | 2128.1 | 2180.7 | 2184.6 | 4.34 |
| | 2 | 2170.0 | 2671.5 | 2470.5 | 2719.9 | 2762.9 | 2917.3 | 3022.8 | 3028.2 | 4.88 |
| | 3 | 2674.1 | 3292.2 | 3045.4 | 3351.9 | 3419.4 | 3609.9 | 3748.4 | 3754.8 | 4.97 |
| | 4 | 3381.3 | 4162.3 | 3847.0 | 4235.0 | 4325.2 | 4567.0 | 4739.1 | 4747.5 | 4.97 |
| | 5 | 6024.0 | 7413.1 | 6778.3 | 7462.3 | 7590.7 | 8013.2 | 8274.6 | 8287.6 | 4.66 |

| **17% Sales Tax** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Average % change | Change relative to base |
| Quintile | | | | | | | | | | | |
| | 1 | 1613.5 | 1987.8 | 1815.1 | 2000.9 | 1995.7 | 2107.1 | 2164.8 | 2148.4 | 4.18 | -3.73 |
| | 2 | 2156.1 | 2653.8 | 2452.9 | 2703.3 | 2733.6 | 2886.2 | 2998.5 | 2976.0 | 4.71 | -3.36 |
| | 3 | 2656.5 | 3269.4 | 3022.7 | 3330.4 | 3382.3 | 3570.4 | 3717.2 | 3688.9 | 4.80 | -3.34 |
| | 4 | 3357.6 | 4131.8 | 3817.3 | 4205.9 | 4277.3 | 4515.5 | 4698.4 | 4662.4 | 4.80 | -3.33 |
| | 5 | 5974.8 | 7351.9 | 6722.1 | 7405.0 | 7506.1 | 7922.5 | 8204.9 | 8140.0 | 4.52 | -3.13 |

**45% Corporate Tax**

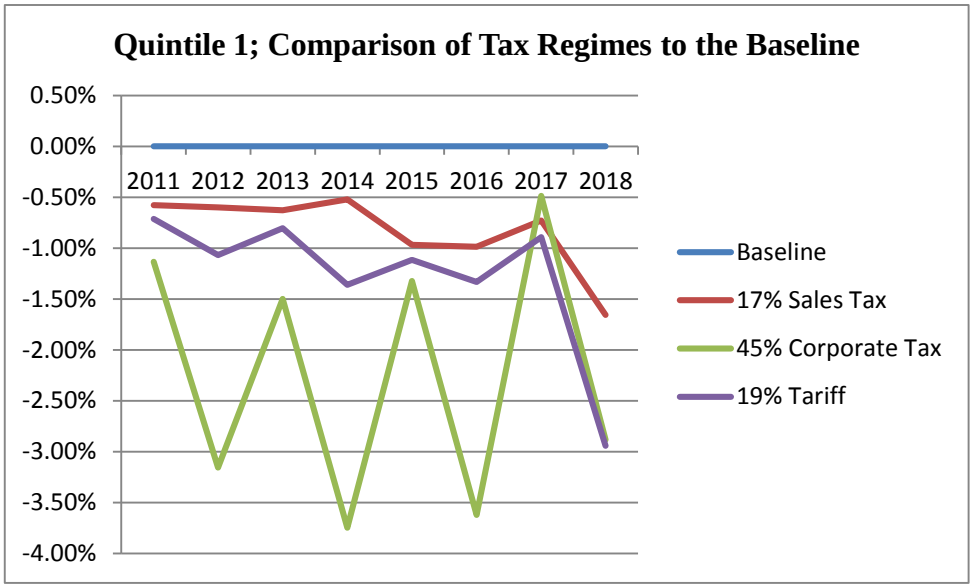
| Quintile | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Average % change | Change relative to base |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1604.5 | 1936.7 | 1799.2 | 1936.0 | 1988.5 | 2051.0 | 2170.1 | 2121.6 | 4.07 | -6.12 |
| 2 | 2141.8 | 2582.7 | 2428.0 | 2611.6 | 2718.5 | 2804.1 | 2999.3 | 2932.6 | 4.59 | -5.83 |
| 3 | 2637.8 | 3180.7 | 2990.3 | 3215.6 | 3361.3 | 3466.7 | 3716.0 | 3633.7 | 4.68 | -5.76 |
| 4 | 3331.2 | 4016.7 | 3774.7 | 4059.3 | 4249.6 | 4382.9 | 4694.2 | 4590.2 | 4.69 | -5.66 |
| 5 | 5915.3 | 7131.8 | 6644.3 | 7143.4 | 7465.3 | 7697.3 | 8209.6 | 8025.0 | 4.45 | -4.48 |

**19% Tariff**

| Quintile | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Average % change | Change relative to base |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1611.3 | 1978.4 | 1811.9 | 1984.0 | 1992.7 | 2099.7 | 2161.2 | 2120.3 | 4.00 | -7.79 |
| 2 | 2154.4 | 2642.9 | 2450.4 | 2682.6 | 2731.6 | 2878.0 | 2995.3 | 2938.6 | 4.53 | -6.99 |
| 3 | 2654.6 | 3256.7 | 3020.4 | 3306.0 | 3380.4 | 3560.9 | 3714.0 | 3643.3 | 4.63 | -6.88 |
| 4 | 3356.7 | 4117.8 | 3815.3 | 4176.3 | 4275.5 | 4504.5 | 4694.6 | 4605.8 | 4.62 | -6.93 |
| 5 | 5981.4 | 7336.9 | 6724.0 | 7359.0 | 7506.1 | 7906.6 | 8198.4 | 8042.1 | 4.32 | -7.35 |

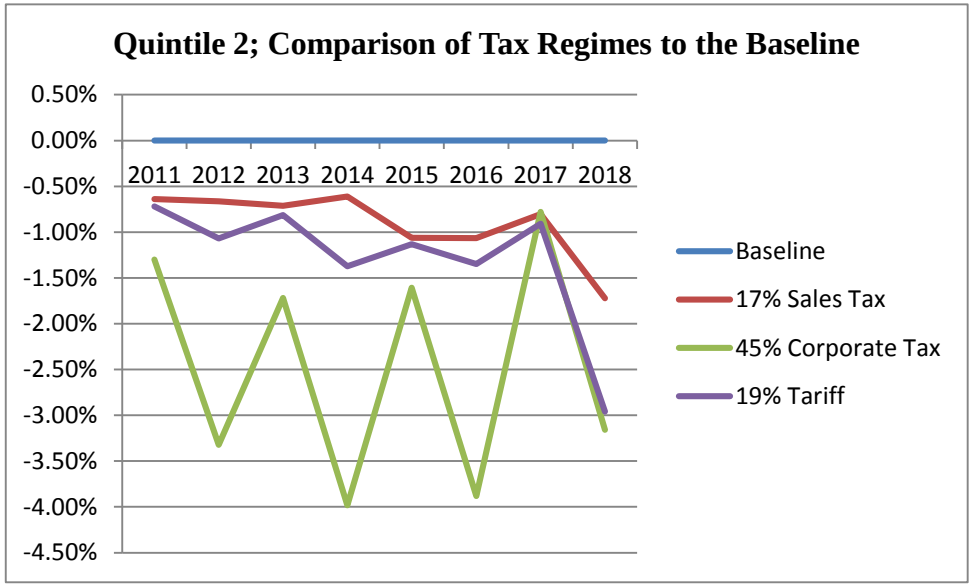
**Quintile 1; Comparison of Tax Regimes to the Baseline**

| Quintile 1 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **Baseline** | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 17% Sales Tax | -0.58% | -0.60% | -0.63% | -0.52% | -0.97% | -0.99% | -0.73% | -1.66% |
| 45% Corporate Tax | -1.13% | -3.16% | -1.50% | -3.75% | -1.32% | -3.62% | -0.49% | -2.88% |
| 19% Tariff | -0.71% | -1.07% | -0.80% | -1.36% | -1.12% | -1.33% | -0.89% | -2.94% |



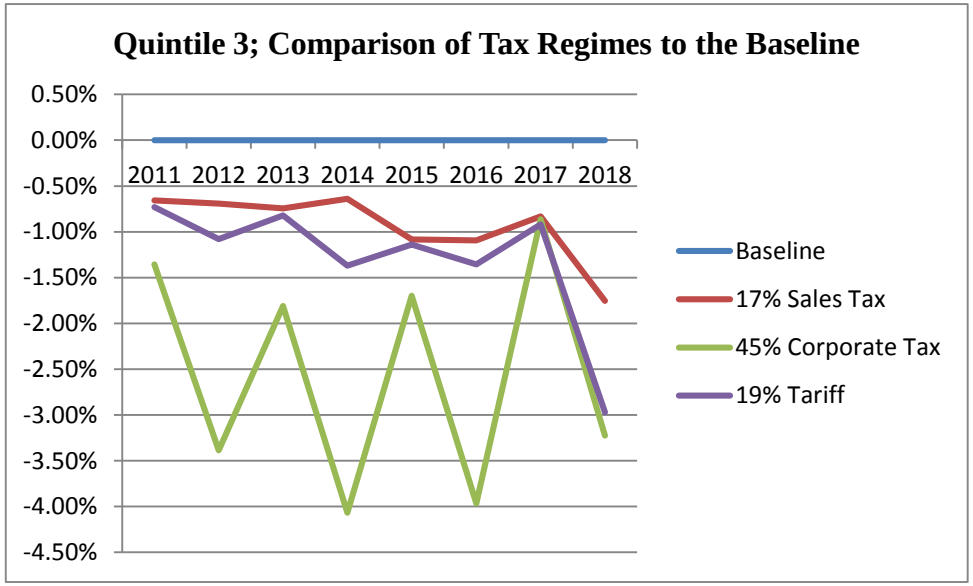
**Quintile 2; Comparison of Tax Regimes to the Baseline**

| Quintile 2 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **Baseline** | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 17% Sales Tax | -0.64% | -0.66% | -0.71% | -0.61% | -1.06% | -1.07% | -0.80% | -1.72% |
| 45% Corporate Tax | -1.30% | -3.32% | -1.72% | -3.98% | -1.61% | -3.88% | -0.78% | -3.16% |
| 19% Tariff | -0.72% | -1.07% | -0.81% | -1.37% | -1.13% | -1.35% | -0.91% | -2.96% |



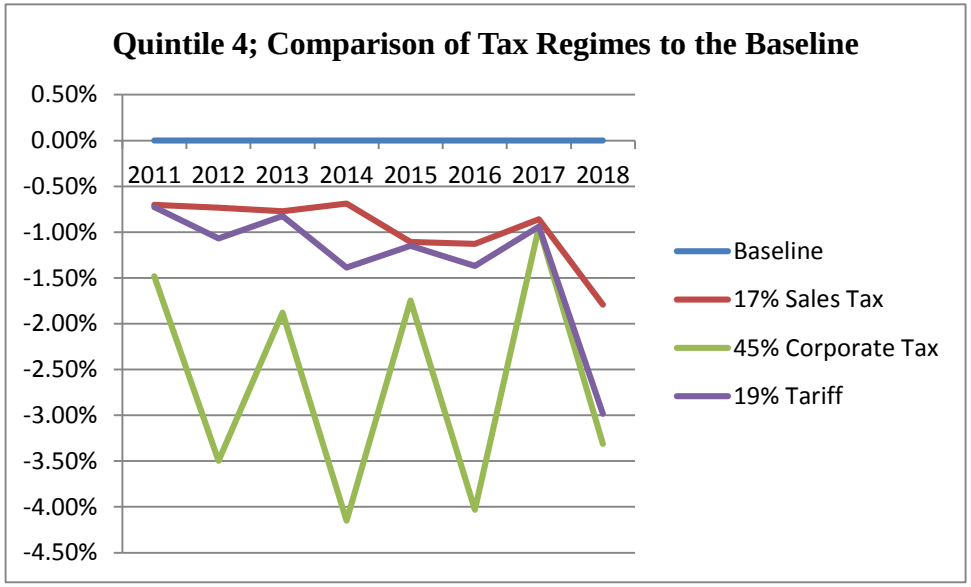
**Quintile 3; Comparison of Tax Regimes to the Baseline**

| Quintile 3 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **Baseline** | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 17% Sales Tax | -0.66% | -0.69% | -0.75% | -0.64% | -1.08% | -1.09% | -0.83% | -1.76% |
| 45% Corporate Tax | -1.36% | -3.39% | -1.81% | -4.07% | -1.70% | -3.97% | -0.86% | -3.23% |
| 19% Tariff | -0.73% | -1.08% | -0.82% | -1.37% | -1.14% | -1.36% | -0.92% | -2.97% |



**Quintile 4; Comparison of Tax Regimes to the Baseline**

| Quintile 4 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **Baseline** | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 17% Sales Tax | -0.70% | -0.73% | -0.77% | -0.69% | -1.11% | -1.13% | -0.86% | -1.79% |
| 45% Corporate Tax | -1.48% | -3.50% | -1.88% | -4.15% | -1.75% | -4.03% | -0.95% | -3.31% |
| 19% Tariff | -0.73% | -1.07% | -0.82% | -1.39% | -1.15% | -1.37% | -0.94% | -2.98% |



**Quintile 5; Comparison of Tax Regimes to the Baseline**

| Quintile 5 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| **Baseline** | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 17% Sales Tax | -0.82% | -0.83% | -0.83% | -0.77% | -1.11% | -1.13% | -0.84% | -1.78% |
| 45% Corporate Tax | -1.80% | -3.79% | -1.98% | -4.27% | -1.65% | -3.94% | -0.79% | -3.17% |
| 19% Tariff | -0.71% | -1.03% | -0.80% | -1.38% | -1.11% | -1.33% | -0.92% | -2.96% |

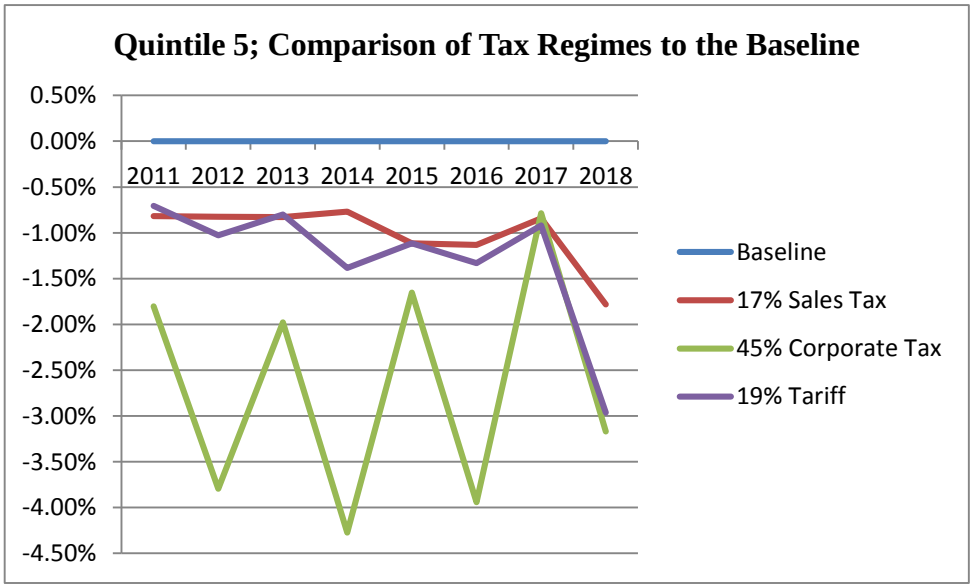


**Table 6: Poverty Rates in the Economy: Difference between Counterfactual Cases and Baseline**

**Percentage points**

| Year | Base | Sales tax | Corp. tax | Tariff |
|---|---|---|---|---|
| 2011 | 0.00 | 0.47 | 0.79 | 0.60 |
| 2012 | 0.00 | 0.16 | 1.00 | 0.33 |
| 2013 | 0.00 | 0.23 | 0.56 | 0.34 |
| 2014 | 0.00 | 0.07 | 0.99 | 0.37 |
| 2015 | 0.00 | 0.31 | 0.36 | 0.37 |
| 2016 | 0.00 | 0.18 | 0.69 | 0.24 |
| 2017 | 0.00 | 0.09 | 0.01 | 0.14 |
| 2018 | 0.00 | 0.32 | 0.52 | 0.60 |
| Average | 0.00 | 0.23 | 0.61 | 0.37 |

**Table 7: Inequality as Measured by the Gini Coefficient**

| Gini coefficient | | | | | Change relative to baseline (percent) | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Baseline | Sales Tax 1 | Corp Tax | Tariff | Year | Sales Tax 1 | Corp Tax | Tariff |
| 2011 | 0.29949 | 0.29886 | 0.29767 | 0.29956 | 2011 | -0.21 | -0.61 | 0.02 |
| 2012 | 0.29930 | 0.29866 | 0.29747 | 0.29938 | 2012 | -0.21 | -0.61 | 0.03 |
| 2013 | 0.29831 | 0.29787 | 0.29731 | 0.29835 | 2013 | -0.15 | -0.34 | 0.01 |
| 2014 | 0.29824 | 0.29779 | 0.29723 | 0.29828 | 2014 | -0.15 | -0.34 | 0.01 |
| 2015 | 0.29975 | 0.29954 | 0.29948 | 0.29983 | 2015 | -0.07 | -0.09 | 0.03 |
| 2016 | 0.29974 | 0.29953 | 0.29947 | 0.29982 | 2016 | -0.07 | -0.09 | 0.03 |
| 2017 | 0.29953 | 0.29939 | 0.29949 | 0.29955 | 2017 | -0.05 | -0.01 | 0.01 |
| 2018 | 0.29955 | 0.29942 | 0.29953 | 0.29957 | 2018 | -0.04 | -0.01 | 0.01 |

## Appendix 2: Data Sources

### Production

The input-output (IO) matrix is taken from the social accounting matrix (SAM) developed in Debowicz et al (2013), where we use the tab PSAM2C to derive the matrix representing 2010 technology. The IO matrix is 50x50, but in order to simplify computations we have aggregated the matrix to 27x27, where row and column 27 represent a single aggregate import. Sectoral value added functions are assumed to be Cobb-Douglas, with shares of the 5 different types of capital, urban and rural labor, and land giving the weights in the valued added function. These are also derived from PSAM2C. We have not directly estimated sectoral investment functions. Rather, we have assumed that the investment function, as in equation (2) is uniform across the 5 types of sectoral capital and is given by the value added function for the construction industry, taken from the SAM. Rates of investment will differ across capital types because of the differing rates of return to capital in different sectors. Finally, the coefficients $\alpha, \gamma$ representing the tax evasion and credit rationing in equations (3), (4) are taken to be uniform across sectors and are determined from calibration. For this exercise we have assumed that $\gamma = 0$, that is, no credit rationing.

### Consumption

For the utility function described in equation (5) we use weights derived from the SAM, tab EH. This gives shares of consumption for each household type, and we assume Cobb-Douglas utilities for each household. Factor allocations for each household category are taken from PSAM2C, which allocates various types of capital, labor and land across households. We aggregate land into a single type, and labor

is aggregated into urban and rural. We suppose that there is a uniform money demand function across all consumers, and we take the parameters of the equation from Qayyum, A. (2005).

**Fiscal Parameters**

Tax rates for the benchmark case are taken from KPMG (2012). Levels of public expenditure are taken from Pakistan Statistical Yearbook (various issues), Table 10. We assume that the public sector produces current expenditure with a Cobb-Douglas function whose shares of capital and labor are given by the aggregate shares of these factors in private production, where the shares are taken from the Pakistan National Income Accounts. The public investment function, which determines public capital spending, is taken to have the same parameters as the private investment functions.

**References**

Debowicz, Dario, Paul Dorosh, Hamza Syed Haider, Sherman Robinson (2013), "A Disaggregated and Macro-consistent Social Accounting Matrix for Pakistan", Journal of Economic Structures (2013) 2:4.

Feltenstein, A, and M. Cyan (2013), "A Computational General Equilibrium Approach to Sectoral Analysis for Tax Potential: An Application to Pakistan, Journal of Asian Economics 27, pp. 57-80.

Feltenstein, A., and Gohar Sedrakyan (2013), "Fiscal Policy and Income Distribution: The Case of Pakistan" Georgia State University.

Feltenstein, A., and Maral Shamloo (2013), "Tax Reform, the Informal Economy, and Bank Financing of Capital Formation", International Tax and Public Finance**,** Vol. 20, no. 1: pp. 1–28.

Feltenstein, Andrew, Luciana Lopes, Janet Porras-Mendoza, and Sally Wallace. "Modeling Tax Reform in Developing Countries" (2014), in *Taxation and Development: The Weakest Link?* Bird, R. and J. Martinez-Vazquez (eds.), Edward Elgar Publishing, pp. 69-102.

International Center for Public Policy, Andrew Young School of Policy Studies (2011), "The Development of a Micro-Simulation Model for the Federal Board of Revenue, Pakistan."

International Monetary Fund, 2010, 'Pakistan Poverty Reduction Strategy Paper 2010', IMF Country Report No. 10/183

Kiyotaki, N. and J. Moore (1997), "Credit Cycles". *Journal of Political Economy*, **105**(2): 211–248.

Kleven, H., & Mazhar Waseem, 2013. "Using Notches to Uncover Optimization Frictions and Structural Elasticities: Theory and Evidence from Pakistan," The Quarterly Journal of Economics, vol. 128(2), pages 669-723.

Pakistan National Income Accounts (Various Issues)

Qayyum, A. (2005). "Modelling the Demand for Money in Pakistan", *Pakistan Development Review*, **44**(3): 233.

Raihan, S. (2010), "Welfare and Poverty Impacts of Trade Liberalization: A Dynamic CGE Microsimulation Analysis", International Journal of Microsimulation, Vol 3, No 1, pp 123-126.

Sah, Raaj, (1983), "How much Redistribution is Possible through Commodity Taxes?" Journal of Public Economics 20: pp.89-101.

Samwalk (2010), "A Social Accounting Matrix for Pakistan." This is based upon Debowicz et al (2013) and was provided by the World Bank.

Shleifer, A. and R.W. Vishny (1993). "Corruption". *The Quarterly Journal of Economics*, **108**(3): 599–618.

Word Bank Group, 2014, "Country Partnership Strategy for the Islamic Republic of Pakistan for the period FY15-19", Report No. 84645-PK